

How to connect CubeCell to TTN(The-Things-Network)

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Overview

[CubeCell Series](#) is an efficient, low-cost LoRa node solution device by the Heltec AutoMation development team.

CubeCell has lower power consumption than ESP32 (sleep current 3.5uA), better impedance matching design, better RF power (core integration SX126x), and reserved solar panel interface to support 5.5V to 7V solar panels .

The CubeCell series of devices can be developed through the exclusive underlying layer developed by the HelTec team to perfectly support the convenient Arduino IDE.

The installation environment can be automatically installed by one-click download of the Arduino IDE [How to install and develop the CubeCell Arduino development environment](#)

This article aims to describe how to connect the [CubeCell Series \(CubeCell-Board\)](#) to the TTN via the OTAA method in the LoRaWAN example.



Preparation

- Arduino IDE.
- First we need a gateway to connect to the TTN (for example, HT-M01), how to connect the gateway (HT-M01, HT-M02) to the TTN, please refer to [here](#).
- A CubeCell-Board or CubeCell-Capsule and a premium USB cable.
- In this example, I use HT-M01 Gateway and drive it through Windows ® via USB, and use CubeCell-Board to quickly connect to TTN.

Configure node information

First we have to create a new CubeCell-Board node in the TTN.

REGISTER DEVICE

[bulk import devices](#)

Device ID

This is the unique identifier for the device in this app. The device ID will be immutable.

19519



Device EUI

The device EUI is the unique identifier for this device on the network. You can change the EUI later.

22 32 33 00

8 bytes

App Key

The App Key will be used to secure the communication between your device and the network.

88 88 88 88 88 88 88 88

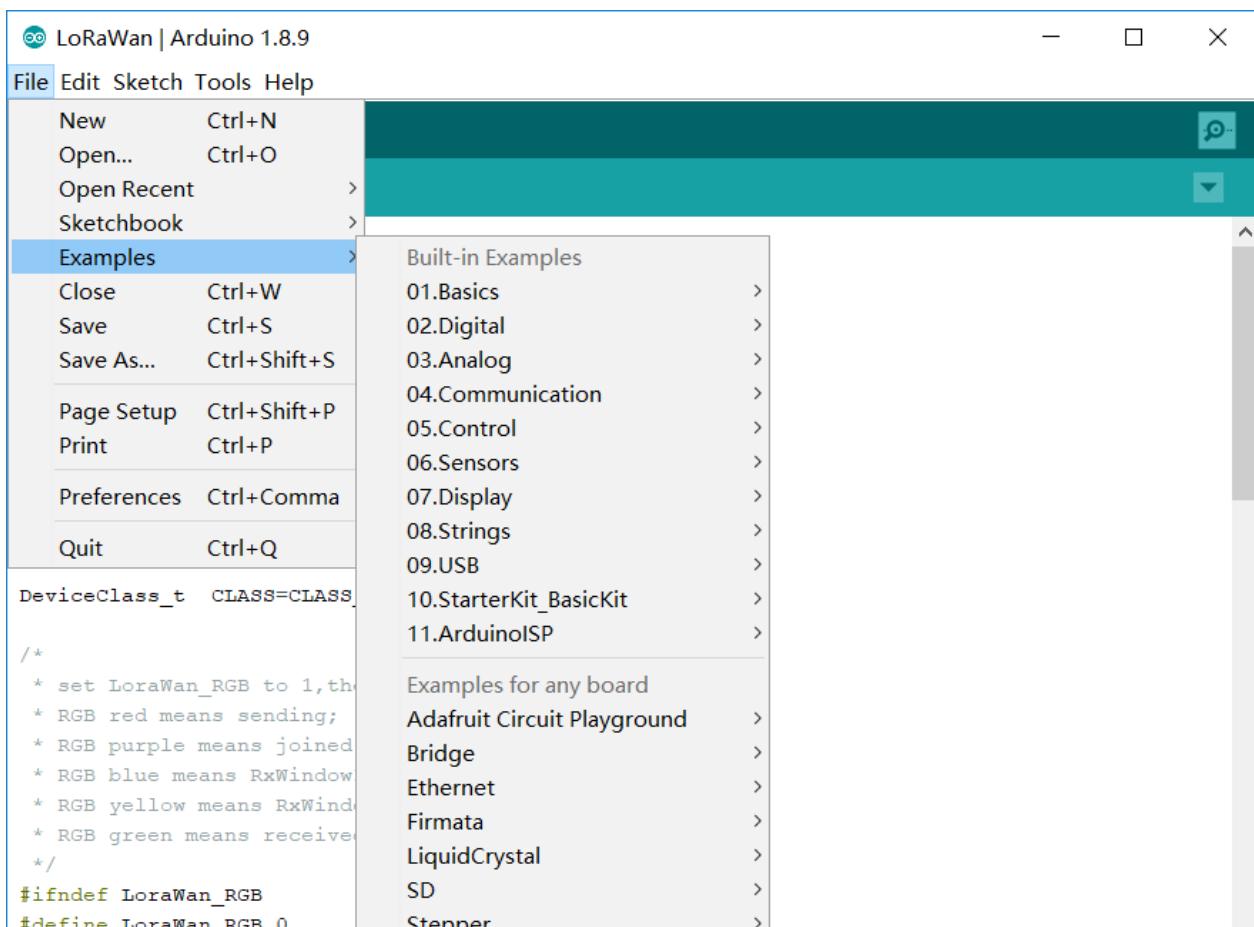
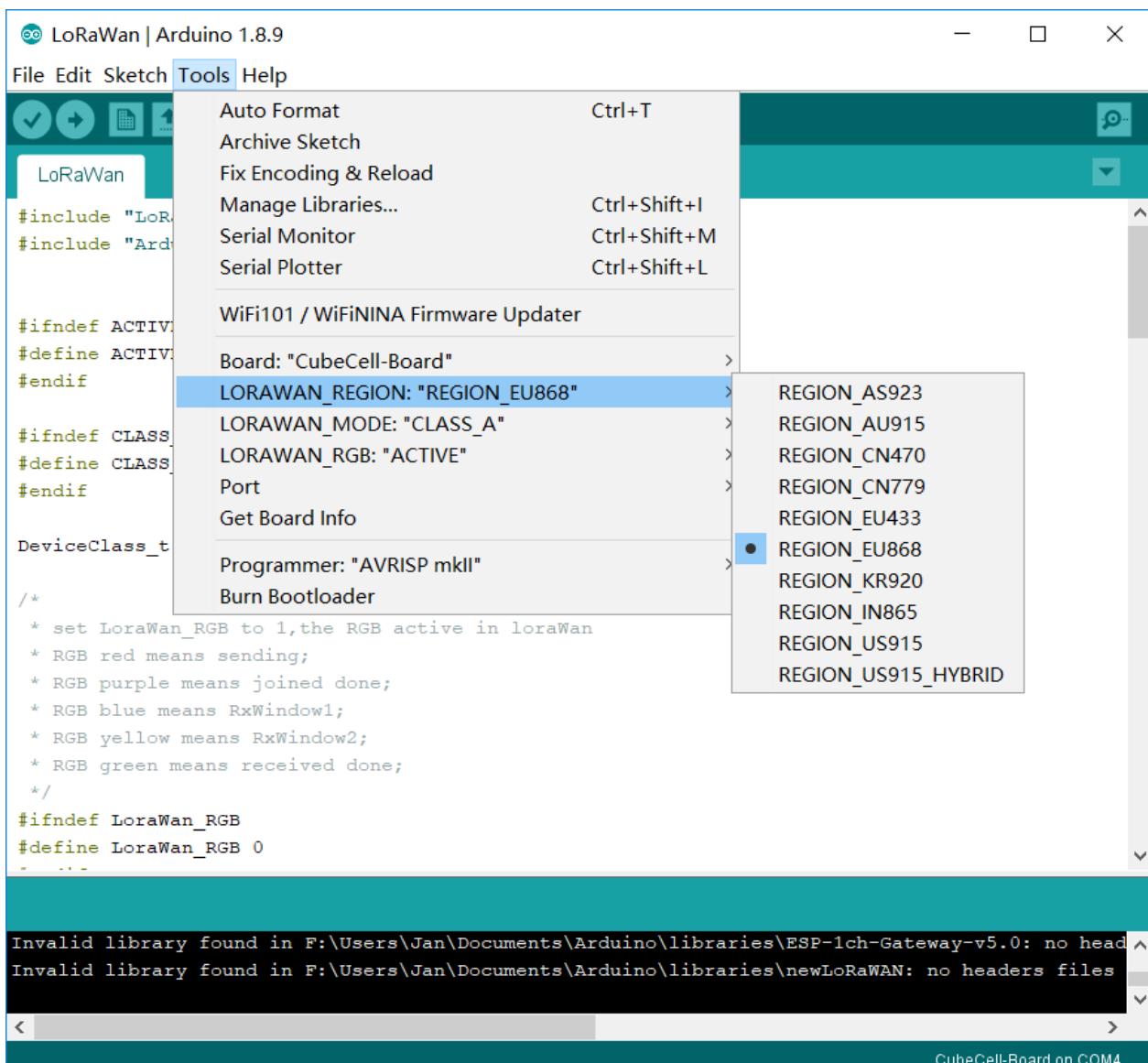
16 bytes

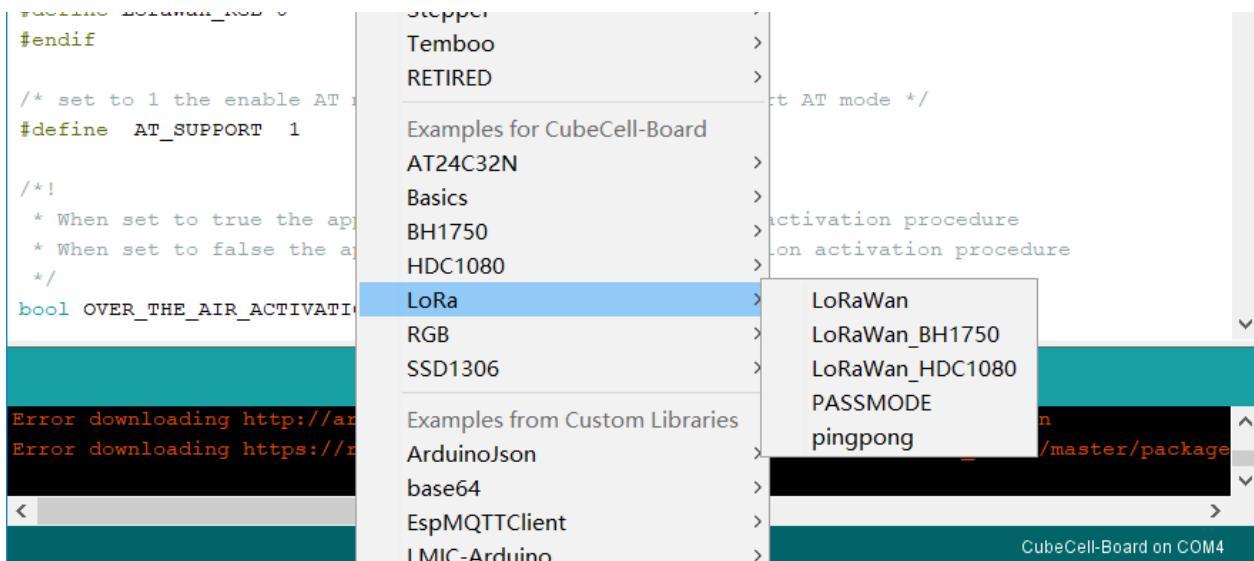
App EUI

11 00 77

[Cancel](#)[Register](#)

- After installing the CubeCell Arduino IDE development environment, select CubeCell-Board in the Arduino, and the working frequency band, and select LoRaWAN example.
- I need the CubeCell-Board to work in the EU 868 band in Class A mode, which requires:





- 1. Make sure the AT command mode is turned on and the required features are turned on.

```
#define AT_SUPPORT 1
```

For example, turn on the RGB light.

```
#define LoraWan_RGB 1
```

- 2. Click to download.
- 3. The node access information is configured through the AT command.

Open the serial port (COM4) and reset the CubeCell-Board. After the node is started, you can observe the printing:

ATK XCOM V2.0

```
Copyright @ 2019 Heltec Automation. All rights reserved. [2019-10-12 01:01:50.554]
LoRaWan ClassA test start! [2019-10-12 01:01:50.751]
[2019-10-12 01:01:50.751]
+LORAWAN=1 [2019-10-12 01:01:50.753]
[2019-10-12 01:01:50.753]
+OTAA=1 [2019-10-12 01:01:50.753]
+Class=A [2019-10-12 01:01:50.756]
+ADR=1 [2019-10-12 01:01:50.756]
+IsTxConfirmed=1 [2019-10-12 01:01:50.756]
+AppPort=2 [2019-10-12 01:01:50.759]
+DutyCycle=15000 [2019-10-12 01:01:50.762]
+ConfirmedNbTrials=8 [2019-10-12 01:01:50.762]
+DevEui=2232330000 (For OTAA Mode) [2019-10-12 01:01:50.766]
+AppEui=70B3D57ED (For OTAA Mode) [2019-10-12 01:01:50.769]
+AppKey=888888888888888888888888 (For OTAA Mode) [2019-10-12 01:01:50.775]
+NwkSKey=D72C78758CDCCABF55EE4A778D (For ABP Mode) [2019-10-12 01:01:50.778]
+AppSKey=15B1DOEFA463DFBE3D11181E1E (For ABP Mode) [2019-10-12 01:01:50.783]
+DevAddr=007E6AE1 (For ABP Mode) [2019-10-12 01:01:50.786]
[2019-10-12 01:01:50.786]
joining...|
```

At the beginning we need to send arbitrary data to the COM to wake up the MCU.

ATK XCOM V2.0

```
Copyright @ 2019 Heltec Automation. All rights reserved. [2019-10-12 11:59:13.791]
LoRaWan ClassA test start! [2019-10-12 11:59:13.912]
[2019-10-12 11:59:13.912]
+LORAWAN=1 [2019-10-12 11:59:13.914]
[2019-10-12 11:59:13.914]
+OTAA=1 [2019-10-12 11:59:13.914]
+Class=A [2019-10-12 11:59:13.914]
+ADR=1 [2019-10-12 11:59:13.914]
+IsTxConfirmed=1 [2019-10-12 11:59:13.917]
+AppPort=2 [2019-10-12 11:59:13.919]
+DutyCycle=60000 [2019-10-12 11:59:13.919]
+ConfirmedNbTrials=8 [2019-10-12 11:59:13.921]
+DevEui=2232330000 (For OTAA Mode) [2019-10-12 11:59:13.924]
+AppEui=70B3D57ED (For OTAA Mode) [2019-10-12 11:59:13.929]
+AppKey=8888888886000000d888888888 (For OTAA Mode) [2019-10-12 11:59:13.934]
+NwkSKey=D72C78758CDCCABF55EE4A7 (For ABP Mode) [2019-10-12 11:59:13.938]
+AppSKey=15B1DOEFA463DFBE3D11181E1E (For ABP Mode) [2019-10-12 11:59:13.945]
+DevAddr=007E6AE1 (For ABP Mode) [2019-10-12 11:59:13.945]
[2019-10-12 11:59:13.947]
joining... ASR is Waked, LowPower Mode Stopped [2019-10-12 11:59:16.490]
```

单条发送 多条发送 协议传输 帮助

Hi

We will see the information returned by CubeCell-Board.

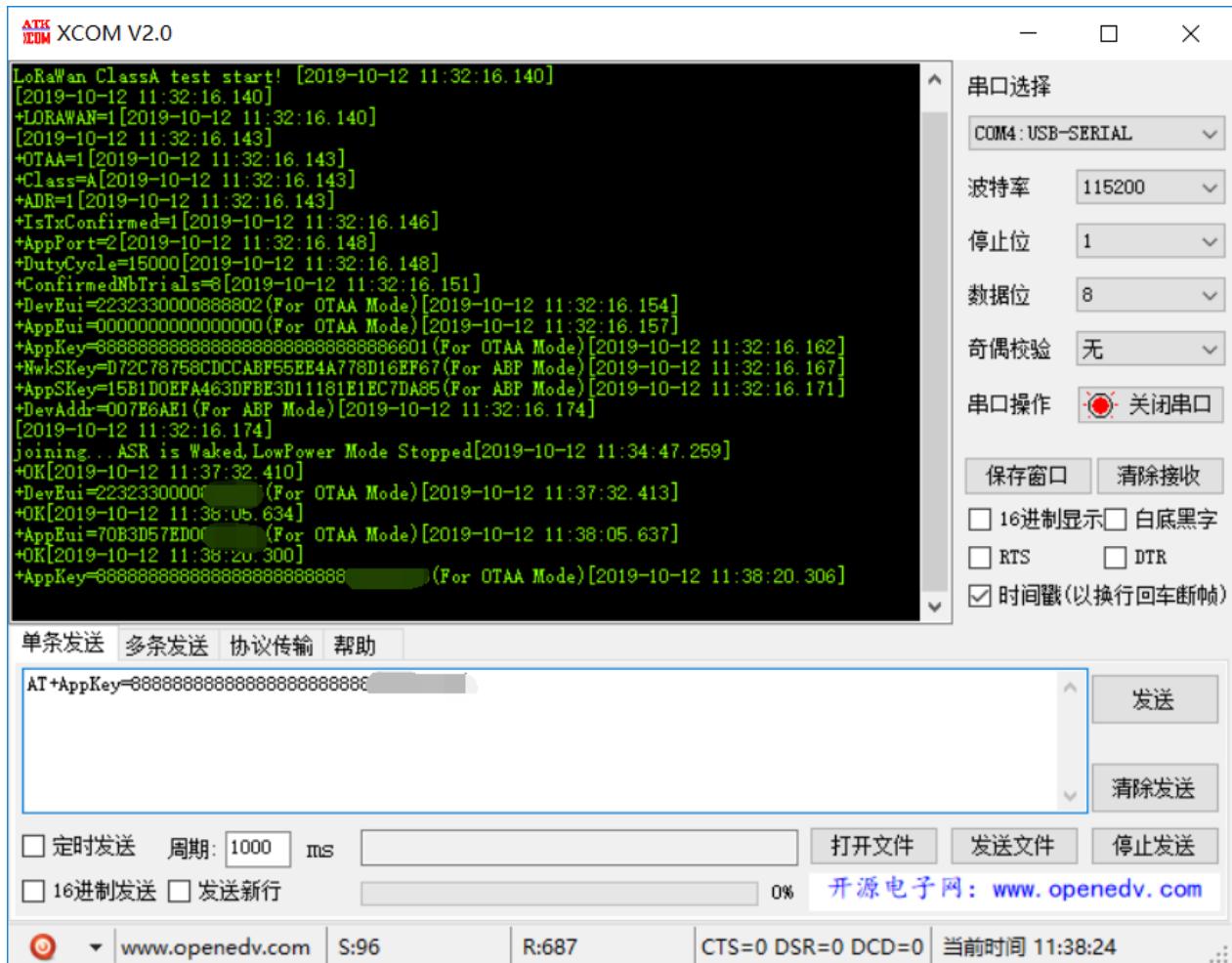
ASR is Waked, LowPower Mode Stopped

After waking up the MCU, we can start to configure the DevEui, AppEui, AppKey of the registered nodes to CubeCell-Board.

E.g:

```
AT+DevEui=2232330000*****
AT+AppKey=88888888888888888888888888888888*****
AT+AppEui=70B3D57ED00*****
```

PS: '*' is the actual registered number. We need to be careful to ensure that the interval between each instruction is >100ms as much as possible to avoid some unnecessary bugs.



The node works in Class A mode by default, and the sending period is 15s. By default, ADR is enabled.

For example, I need to modify the send period to 60s and query the EUI of the node:

```
AT+DutyCycle=60000
AT+DevEui=?
```

```
+DutyCycle=60000[2019-10-12 11:54:09.704]
+OK[2019-10-12 11:54:57.056]
+DevEui=2232330000888805(For OTAA Mode)[2019-10-12 11:54:57.062]
```

单条发送 多条发送 协议传输 帮助

```
AT+DevEui=?
```

Please note that the configuration of the node's network access information must take effect only when the node is reset or the next time it enters the network. The parameters that have been configured by the node are printed after reset.

The CubeCell-Board can be reset by sending `AT+RESET=1`.

```
AT&T XCOM V2.0
```

```
+NwkSKey=D72C78758CDCCABF55EE4A    (For ABP Mode)[2019-10-12 12:00:39.048]
+AppSKey=15B1DOEFA463DFBE3D1118    (For ABP Mode)[2019-10-12 12:00:39.054]
+DevAddr=007E6AE1(For ABP Mode)[2019-10-12 12:00:39.057]
[2019-10-12 12:00:39.057]
joining... ASR is Waked, LowPower Mode Stopped[2019-10-12 12:05:47.977]
+OK[2019-10-12 12:05:56.098]
Copyright @ 2019 Heltec Automation. All rights reserved. [2019-10-12 12:05:56.117]
LoRaWan ClassA test start! [2019-10-12 12:05:56.236]
[2019-10-12 12:05:56.236]
+LORAWAN=1[2019-10-12 12:05:56.236]
[2019-10-12 12:05:56.236]
+OTAA=1[2019-10-12 12:05:56.241]
+Class=A[2019-10-12 12:05:56.241]
+ADR=1[2019-10-12 12:05:56.241]
+IsTxConfirmed=1[2019-10-12 12:05:56.241]
+AppPort=2[2019-10-12 12:05:56.245]
+DutyCycle=60000[2019-10-12 12:05:56.245]
+ConfirmedNbTrials=3[2019-10-12 12:05:56.245]
+DevEui=2232330000    (For OTAA Mode)[2019-10-12 12:05:56.248]
+AppEui=70B3D57ED0L    (For OTAA Mode)[2019-10-12 12:05:56.252]
+AppKey=88888888888888888888888888888888    (For OTAA Mode)[2019-10-12 12:05:56.258]
+NwkSKey=D72C78758CDCCABF55EE4A7    (For ABP Mode)[2019-10-12 12:05:56.265]
+AppSKey=15B1DOEFA463DFBE3D11181    (For ABP Mode)[2019-10-12 12:05:56.268]
+DevAddr=007E6AE1(For ABP Mode)[2019-10-12 12:05:56.272]
[2019-10-12 12:05:56.272]
joining...
```

单条发送 多条发送 协议传输 帮助

```
AT+RESET=1
```

The CubeCell-Board completes the reset and starts to enter the network.

Return to TTN to view:

The screenshot shows the TTN Device Overview page. At the top, the navigation path is Applications > 32455444554 > Devices > 19519. The main title is DEVICE OVERVIEW. Below it, the Application ID is 32455444554 and the Device ID is 19519. The Activation Method is OTAA. The page displays various device identifiers and session keys in hex format, each with copy and paste icons. The Device EUI is 22 32 33 00 00 [REDACTED]. The Application EUI is 70 B3 D5 7E D0 0 [REDACTED]. The App Key is a long string of dots followed by a copy icon. The Device Address is 26 01 23 CD. The Network Session Key and App Session Key are both long strings of dots followed by copy icons. Below these, the Status is green with the message "11 seconds ago". The Frames up count is 0 with a link to "reset frame counters". The Frames down count is 0.

Applications > 32455444554 > Devices > 19519

DEVICE OVERVIEW

Application ID 32455444554

Device ID 19519

Activation Method OTAA

Device EUI 22 32 33 00 00 [REDACTED]

Application EUI 70 B3 D5 7E D0 0 [REDACTED]

App Key [REDACTED]

Device Address 26 01 23 CD

Network Session Key [REDACTED]

App Session Key [REDACTED]

Status 11 seconds ago

Frames up 0 [reset frame counters](#)

Frames down 0

CubeCell-Board has successfully connected to TTN!

Enjoy!